

3.3 HAZARD PROFILES

3.3.1 Communicable Disease

Communicable diseases, sometimes called infectious diseases, are illnesses caused by organisms such as bacteria, viruses, fungi and parasites. Sometimes the illness is not due to the organism itself, but rather a toxin that the organism produces after it has been introduced into a human host. Communicable diseases may be transmitted (spread) either by: one infected person to another, from an animal to a human, from an animal to an animal, or from some inanimate object (doorknobs, table tops, etc.) to an individual. A **pandemic** is a global disease outbreak.

Communicable disease could be devastating to the population or economy of the State. Human diseases, when on an epidemic scale, can lead to high infection rates in the population causing quarantines and mass fatalities. Contagious animal and plant diseases could distress the agricultural community affecting the food supplies and the livestock industry.

3.3.1.1 Background

Following is a general description of some communicable diseases that have either affected Montana in the past, or have been profiled on a national level in recent years. It should be noted that this list is by no means inclusive of all communicable diseases that could affect the population or economy of the State of Montana.

3.3.1.1.1 Human Diseases

Viral Diseases

Hantavirus

Hantavirus pulmonary syndrome (HPS) is a deadly disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in the aerosolized virus. Aerosolization occurs when dried materials contaminated by rodent excreta or saliva are disturbed. HPS cannot be transmitted from one person to another. HPS was first recognized in 1993 after a cluster of previously healthy individuals who lived in the Four Corners area of New Mexico acquired the illness. It has since been identified throughout the U.S. Although rare, HPS is potentially deadly (CDC, 2007).

HIV and AIDS

HIV (human immunodeficiency virus) causes AIDS (acquired immunodeficiency syndrome). HIV is different from most other viruses because it attacks the immune system and our ability to fight infections. HIV finds and destroys a type of white blood cell that the immune system must have to fight disease. AIDS is the final stage of HIV infection and is fatal. It can take years for a person infected with HIV to reach this stage.

HIV is a fragile virus and cannot live for very long outside the body. As a result, the virus is not transmitted through day-to-day activities such as shaking hands, hugging, or a casual kiss. HIV is primarily found in the blood, semen, or vaginal fluid of an infected person and is transmitted in three main ways: having sex with someone infected with HIV, sharing needles and syringes with someone infected with HIV, or being exposed (fetus to infant) to HIV before or during birth or through breast feeding.

Norovirus

Noroviruses are a group of highly contagious viruses that cause acute gastroenteritis in humans. Noroviruses are transmitted primarily through the fecal-oral route, either by consumption of fecally contaminated food or water or by direct person-to-person spread. The incubation period for norovirus-associated gastroenteritis in humans is usually between 24 and 48 hours, but cases can occur within 12 hours of exposures. Symptoms usually last from 24 to 60 hours. Recovery is usually complete and there is no evidence of any serious long-term effects (CDC, 2007).

Influenza and Pandemic Influenza

Influenza is a contagious, upper-respiratory disease caused by many different strains of influenza viruses. While many people use the imprecise term “flu” to describe 24- or 48-hour bouts of illness, real influenza can interfere with normal daily activities for as long as a week. Influenza is not a minor inconvenience. As many as 200,000 Americans are hospitalized because of it each year, and as many as 36,000 die of the disease or complications associated with it.

A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. The disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in very short time. Public health officials are closely monitoring a current outbreak of the H5N1 influenza virus among poultry and wild birds in Asia, Europe, and Africa. More than half of the people infected with the H5N1 virus have died. Most of these cases are all believed to have been caused by exposure to infected poultry. There has been no sustained human-to-human transmission of the disease, but the concern is that H5N1 will evolve into a virus capable of human-to-human transmission.

Scientists and health officials believe a pandemic flu could pose a significant threat to the health, economy, and way of life in the U.S. Efforts are under way at the Montana Department of Public Health and Human Services to plan for the complex issues and serious impacts that a new influenza pandemic could cause in Montana.

SARS

Severe Acute Respiratory Syndrome (SARS) is a viral respiratory illness that was recognized as a global threat in March 2003, after first appearing in southern China in November 2002. The primary way that SARS appears to spread is through close person-to-person contact. It is thought to be transmitted most readily by respiratory droplets produced when an infected person coughs or sneezes. The virus also can spread when a person touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose, or eye(s). In addition, it is possible that SARS might be spread more broadly through the air or by other ways that are not now known. The illness usually begins with a high fever that is sometimes associated with chills or other symptoms, including headache, general feeling of discomfort and body aches. Some people also experience mild respiratory symptoms at the outset. From November 2002 through July 2003, a total of 8,098 people worldwide became sick with SARS. Of these, 774 died. By late July 2003, no new cases were being reported, and the global outbreak was considered over. In the U.S., only eight persons were laboratory-confirmed as SARS cases. There were no SARS-related deaths in the U.S. All of the eight persons with laboratory-confirmed SARS had traveled to areas where SARS transmission was occurring (CDC, 2007).

West Nile Virus

West Nile virus (WNV) is a potentially serious illness. West Nile Virus is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall.

Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite. In a very small number of cases, WNV also has been spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby (CDC, 2007). Although WNV is a potentially serious illness, about 80 percent of those infected notice no symptoms and develop immunity. About 20 percent experience mild flu-like symptoms. About 1 in 150 people infected with WNV will develop severe illness, and about one in 1,000 cases is fatal. People over the age of 50 are at greatest risk of serious illness.

Bacterial Diseases

E. coli

Escherichia coli O157:H7 (*E.coli*) is a leading cause of foodborne illness. Based on a 1999 estimate, 73,000 cases of infection and 61 deaths occur in the U.S. each year. Infection with *E. coli* occasionally leads to kidney failure. People can become infected with *E.coli* in a variety of ways. Though most illness has been associated with eating undercooked, contaminated ground beef, people have also become ill from eating contaminated bean sprouts or fresh leafy vegetables such as lettuce and spinach. Person-to-person contact in families and child care centers is also a known mode of transmission. In addition, infection can occur after drinking raw milk and after swimming in or drinking sewage-contaminated water. People generally become ill from *E.coli* two to eight days after being exposed to the bacteria (CDC, 2007).

Salmonella

Salmonella is a group of bacteria that can cause diarrheal illness in humans. They are microscopic living creatures that pass from the feces of people or animals, to other people or other animals. Salmonella are usually transmitted to humans by eating food contaminated with animal feces. Contaminated foods usually look and smell normal. The illness usually lasts 4 to 7 days, and most persons recover without treatment. However, in some persons the Salmonella infection may spread from the intestines to the blood stream, and then to other body sites and can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness (CDC, 2007).

Shigella

Shigellosis is an infectious disease caused by Shigella bacteria and is one of the most contagious types of diarrhea caused by bacteria. It is a common cause of waterborne outbreaks in the U.S., though most of these outbreaks occur in recreational water rather than in drinking water. Infection with Shigella occurs through person-to-person contact when individuals eating contaminated food either from infected food handlers or fields contaminated with sewage, or swallowing contaminated drinking or recreational water. The bacteria can get into groundwater and private wells through discharges from faulty septic systems or sewage treatment plants. Wells may be more vulnerable to such contamination after flooding. Shigella is found in every part of the U.S. and throughout the world, and is also a serious health risk for military personnel deployed in regions where the disease is endemic. Worldwide, there are 165 million new cases of shigellosis each year, causing over one million deaths. The World Health Organization has selected development of a shigellosis vaccine as one of its highest priorities (CDC, 2007).

3.3.1.1.2 Animal and Plant Diseases

Agriculture dominates Montana's economy contributing \$2,324 billion per year with \$1,038 billion coming from crops and \$1,286 billion coming from livestock (USDA National Agriculture Statistics Service, 2006). Wheat is Montana's most important crop followed by hay, barley, and sugar beets. Montana's most important livestock commodities are cattle and calves, followed by hogs and pigs, and sheep and lambs.

The security of the state's crop and livestock industry is of paramount importance to Montana's economy. Some of the animal and plant diseases with the potential to threaten the state's agricultural industry are discussed below.

Anthrax

Anthrax, a highly infectious and fatal disease of mammals and humans, is caused by a relatively large spore-forming bacterium. There are three types of anthrax: cutaneous (spread through contact with the skin), inhalation, and gastrointestinal (caused by ingesting infected meat or milk). About 95 percent of human anthrax infections occur when the bacterium enters a cut or abrasion on the skin during the handling of the animal or animal products.

Grazing animals are typically infected when they ingest or inhale spores on contaminated vegetation or soil. Animals primarily affected are cattle, bison, sheep, goats and horses. In addition, wildlife species such as deer, elk, moose and antelope, as well as wild carnivores, such as coyotes, bobcats, and mountain lions, can also be affected. Typically, the disease in livestock and wildlife appears following periods of climatic or ecological changes, such as heavy rains or flooding preceded by drought. Spores may also be exposed by wind or water erosion, as well as other soil disturbances, such as excavations. These factors make it possible for an outbreak to occur one year, but not the next.

Most outbreaks occur in areas where animals have previously died of anthrax, as the spores remain viable for decades. The predominant sign in cattle with anthrax is a progression from a normal appearance to dead in a matter of hours. Most animals are simply found dead. Once an outbreak begins in the herd animals may be observed with signs of weakness, fever, excitement followed by depression, difficulty breathing, uncoordinated movements and convulsions. After death, the animal's body rapidly decomposes (Cattle Today, 2007). Anthrax is a potentially fatal human pathogen. For animals and humans, anthrax is a reportable disease in the United States.

Brucellosis

Brucellosis causes abortions, infertility, and lowered milk production in cattle and bison and is transmissible to humans as undulant fever. In people, the disease causes severe flu like symptoms that can last for months or years. Treatment in humans is not always successful. Moreover, treatment is not successful in animals (USDA APHIS, 2007).

The only known threat of transmitting brucellosis left in the nation is in bison and elk in the Greater Yellowstone Area. When the high population of bison in Yellowstone exhausts the Park's forage resources, and the bison then migrate out of the Park, the animals pose a serious threat of spreading the disease to the state's cattle and people. This concern has led to controversial management techniques for Yellowstone bison (MDL, n.d.).

Chronic Wasting Disease

Chronic wasting disease (CWD) is a prion disease that affects North American cervids, the known natural hosts being mule deer, white-tailed deer, elk, and moose. CWD was first identified as a fatal wasting syndrome in captive mule deer in Colorado in the late 1960s and in the wild in 1981. It was recognized as a spongiform encephalopathy in 1978. To date, no strong evidence of CWD transmission to humans has been reported. CWD can be highly transmissible within deer and elk populations. The mode of transmission is not fully understood, but evidence supports the possibility that the disease is spread through direct animal-to-animal contact or as a result of indirect exposure to prions in the environment (contaminated feed and water sources).

Specific studies have begun that focus on identifying human prion disease in a population that is at increased risk for exposure to potentially CWD-infected deer or elk meat. Because of the long time between exposure to CWD and the development of disease, many years of continued follow-up are required to be able to say what the risk, if any, of CWD is to humans (CDC, 2007).

Foot-and-Mouth Disease

Foot-and-mouth disease (FMD) is a severe, highly communicable viral disease of cattle and swine. It also affects sheep, goats, deer and other cloven-hoofed ruminants. FMD does not spread to humans or horses. FMD is characterized by fever and blister-like lesions followed by erosions on the tongue and lips, in the mouth, on the teats, and between the hooves. Many affected animals recover, but the disease leaves them debilitated with lameness, poor performance, and reduced milk production. FMD viruses can be spread by animals, people, or materials that bring the virus into physical contact with susceptible animals (Montana Department of Livestock, 2004).

The virus is extremely contagious and spreads rapidly unless it is contained. This usually requires quarantining infected farms, followed by slaughtering and burning all susceptible animals. Because the virus is spread so easily, countries with the disease are banned from exporting animals and their products, creating further economic hardship.

Mad Cow (BSE) Disease

Bovine Spongiform Encephalopathy (BSE) is the scientific term for a disease which affects the brains of cattle. Soon after BSE was first discovered in the United Kingdom, it became more commonly known as "mad cow disease". Unlike most livestock diseases, BSE is not caused by a bacterial or viral infection, but rather is the result of infectious prions. These are unique proteins that may bond with a cow's brain cells, altering their composition and ultimately leading to the animal's death. Mad cow disease is believed to be transferred to cattle when they eat infectious proteins. A disease similar to BSE called Creutzfeldt-Jacob Disease (CJD) is found in people. A variant form of CJD (vCJD) is believed to be caused by eating contaminated beef products from BSE-affected cattle (Mad Cow Facts, 2007).

Plant Diseases

Montana ranks 3rd nationally in all wheat production, 3rd in barley production, 8th in alfalfa hay production, and 6th in sugar beet production (USDA National Agriculture Statistics Service, 2006). These crops represent the major commodities because of their impact on Montana's and the nation's economy and therefore, have special needs for pest management. Many pests are sporadic in their occurrence cycling with environmental conditions such as dry or wet cycles. However, major insect pests such as alfalfa weevil, wheat stem sawfly, wireworms, cutworm species, grasshoppers and cereal leaf beetle are likely to attain pest status in the state each year.

The security of the state's crop production is of paramount importance. Not only will an incident affecting crop production impact individual producers, it could also adversely impact food production and processing, which is an extremely important part of the state's economy. Newly introduced or detected diseases pose an especially serious threat.

A secure agricultural system requires rapid detection of outbreaks, accurate diagnoses of problems, and early response to minimize impact. The USDA Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine Program coordinates pest detection activities nationwide. Plant pest detection coordination is handled locally by the Montana Department of Agriculture and Montana State University (MSU) Extension Service.

3.3.1.2 History and Occurrence of Communicable Disease in Montana

Public health emergencies that have affected Montana include vector-borne disease, such as West Nile Virus, food-borne illness like *E.coli*, and vaccine-resistant illness such as virulent strains of influenza. There are added occurrences of agricultural and livestock disease that have had some impact on the State's economy.

3.3.1.2.1 Human Diseases

The following section provides a history of some of the communicable diseases that have affected the State of Montana. **Table 3.3.1-1** presents a summary of reported cases of many of the vector-borne and food-borne illness that have occurred from 1999 to 2005.

Table 3.3.1-1 Montana Communicable Disease Summary: Reported Cases 1999-2005					
Year	E Coli	Salmonella	Shigella	Hantavirus	West Nile
1999	41	86	10	2	-
2000	48	97	8	4	-
2001	32	81	9	2	0
2002	38	91	4	0	1
2003	28	112	2	5	228
2004	32	188	4	2	6
2005	23	149	5	1	26
TOTAL	242	804	42	16	261

Source: MDPHHS, 2006b

E. coli

An *E.coli* outbreak associated with the Jack in the Box restaurants was in the national spotlight in January 1993 when more than 600 people got sick from eating undercooked hamburgers contaminated with *E.coli*. Most of the victims were children living in Washington state; four of them died. Jack in the Box was initially criticized for its handling of the crisis, losing credibility and stock market value immediately after the outbreak. But observers say the chain quickly recovered by instituting industry standard-setting food handling and cooking techniques (National Law Journal, 1997).

In September 2006, an outbreak of *E.coli* linked to the consumption of bagged spinach resulted in 205 confirmed illnesses and three deaths. Initially it was thought the bacteria originated at the California processing and packaging plant where the contaminated products had been processed. However, other environmental risk factors for *E.coli* at or near the field included the presence of wild pigs, the proximity of irrigation wells used to

grow produce for ready-to-eat packaging, and surface waterways exposed to feces from cattle and wildlife. Because of the many ways *E.coli* can be transferred -- including animals, humans, and water -- the precise means by which the bacteria spread to the spinach remains unknown (FDA, 2007b).

Over 240 cases of *E.coli* were reported in Montana from 1999 to 2005 (**Table 3.3.1-1**). None of these cases resulted in death.

Hantavirus

In this country, hantavirus was first recognized during the spring of 1993 after a cluster of previously healthy individuals who lived in the Four Corners area of New Mexico acquired an acute cardiopulmonary illness. As of July, 2003, there have been 340 confirmed cases of HPS in the United States. Of these, there have been 129 deaths, five in Montana (MSU Ag Extension, 2004). **Table 3.3.1-1** indicates there were 16 reported hantavirus cases in Montana between 1999 and 2005.

HIV and AIDS

HIV was first identified in the United States in 1981. It took several years for scientists to develop a test for the virus, to understand how HIV was transmitted between humans, and to determine what people could do to protect themselves. During the early 1980s, as many as 150,000 people became infected with HIV each year. By the early 1990s, this rate had dropped to about 40,000 each year, where it remains today (CDC, 2007). Since 2001, there are roughly 350 AIDS cases reported annually in Montana.

Norovirus

Norovirus has received attention in Montana in recent years. The Montana Department of Public Health and Human Services (DPHHS) issued a Norovirus Health Alert on May 3, 2006 which advised the public that eight different norovirus outbreaks had sickening approximately 500 residents and staff in long-term care facilities and/or assisted living centers in five separate Montana communities (DPHHS, 2006).

From July 1997 to June 2000, 232 outbreaks of norovirus were reported to the Centers for Disease Control (CDC). Of these cases, 57 percent were foodborne, 16 percent were due to person-to-person spread, and 3 percent were waterborne. In 23 percent of the outbreaks, the cause of transmission was not determined. Common settings for outbreaks include restaurants and catered meals (36 percent), nursing homes (23 percent), schools (13 percent), and vacation settings or cruise ships (10 percent) (CDC, 2007).

Influenza and Pandemic Influenza

The influenza epidemic that swept the world in 1918 killed an estimated 50 million people. This deadly virus afflicted over 25 percent of the U.S. population and over 1/5th of the world's population. Within months, the flu had killed more people than any other illness in recorded history.

The "plague" emerged in two phases. In late spring of 1918, the first phase, known as the "three-day fever," appeared without warning. Few deaths were reported. Victims recovered after a few days. When the disease surfaced again that fall, it was far more severe. Scientists, doctors, and health officials could not identify this disease which was striking so fast and so viciously, eluding treatment and defying control. Some victims died within hours of their first symptoms. Others succumbed after a few days; their lungs filled with fluid and they suffocated to death (National Archives, 2007).

By the time that Montana officials made their first report to the U.S. Public Health Service on October 4, 1918, the pandemic was already sweeping across the state. By October 21, officials made a report, which was "very incomplete," still told of more than 3,500 cases of flu. On November 1st, Montana officials said that at least 11,500 people had been afflicted with the flu over the previous three weeks. The toll could have been higher, since officials admitted that their reports were incomplete. The final death toll in Montana from the 1918 influenza epidemic in Montana will never be known (Moritsugu, 2006).

Pandemics associated with substantial illness and death also occurred in 1957 and 1968. In the Asian influenza pandemic of 1957, in which H2N2 viruses appeared, influenza-associated deaths were estimated at greater than 2 million worldwide. The influenza pandemic of 1968 started in Hong Kong and was caused by an H3N2 virus. This pandemic was much less severe than previous pandemics, with estimated influenza-associated deaths of approximately 1 million (WHO, 2005 in CDC, 2007).

West Nile Virus

West Nile virus was first isolated in the West Nile District of Uganda in 1937. The ecology was characterized in Egypt in the 1950s. The virus became recognized as a cause of severe human meningitis or encephalitis (inflammation of the spinal cord *and* brain) in elderly patients during an outbreak in Israel in 1957. Equine disease was first noted in Egypt and France in the early 1960s. WNV first appeared in North America in 1999, with encephalitis reported in humans and horses. WNV was a significant cause of human illness in the United States in 2002 and 2003 (CDC, 2007).

Montana victims of West Nile Virus have ranged in age from 3 to 91; however, fatalities have involved individuals aged 65 to 84 (DPHHS, 2006). Most counties in eastern Montana have reported human cases of WNV while western Montana has seen primarily equine cases (Figure 3.3.1-1). Between 2002 and 2005, there were 261 reported cases of WNV in Montana and four deaths (Table 3.3.1-2).

Figure 3.3.1-1 West Nile Virus in Montana 2002 to 2005

Source: MDPHHS, 2006a

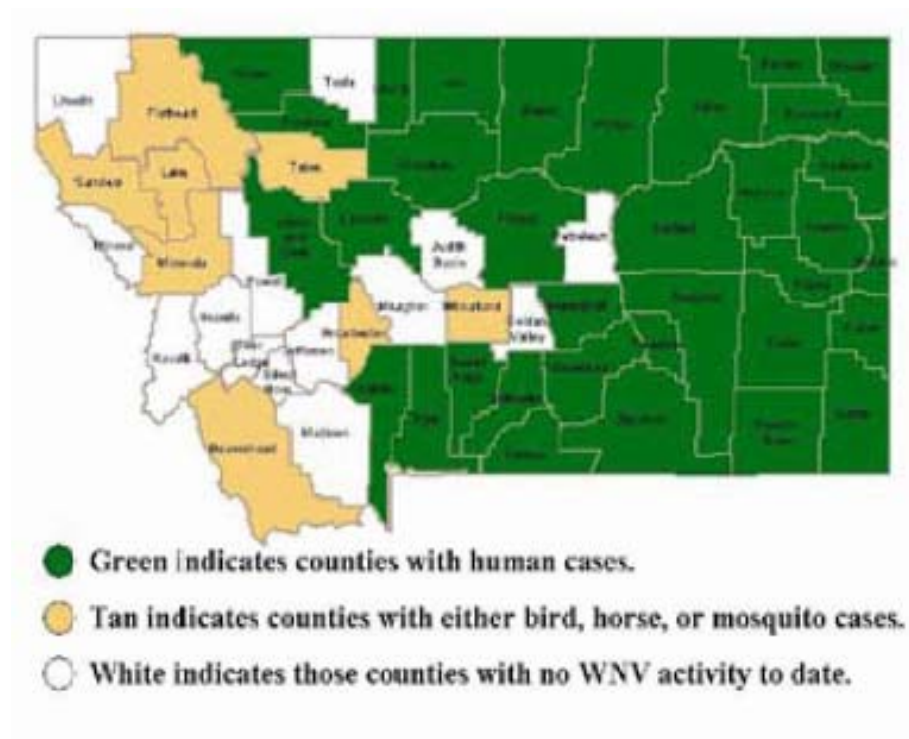


Table 3.3.1-2 Montana Human West Nile Virus Cases: 2002-2005					
Human Cases/Yr	2002	2003	2004	2005	Total
Non-Hospitalizations	0	142	3	18	163
Hospitalizations	0	86	3	7	96
Unknown	1	0	0	1	2
Total Cases	1	228	6	26	261
Deaths	0	4	0	0	4

Source: MDPHHS, 2006 <http://www.dphhs.mt.gov/westnile/2006wnvbrochure.pdf>

Salmonella

Every year, approximately 40,000 cases of salmonellosis are reported in the United States. Because many milder cases are not diagnosed or reported, the actual number of infections may be 30 or more times greater. It is estimated that approximately 600 persons die each year with acute salmonellosis (CDC, 2007). **Table 3.3.1-1** indicates over 800 cases of Salmonella were reported in Montana from 2002 to 2005.

Shigella

Over 40 cases of Shigella were reported in Montana from 1999 to 2005 (**Table 3.3.1-1**). None of these cases resulted in death. In late 2006, a Shigella outbreak occurred in Fremont County Wyoming sickening at least 35 people.

3.3.1.2.2 Animal and Plant Diseases

Anthrax

Anthrax occurs naturally in the United States, predominantly infecting cattle. Human cases are almost without exception cutaneous infections associated with contact with infected animals. A suspected gastro-intestinal case occurred in 2000. The last fatal case of inhalation anthrax occurred in 1976, when a home craftsman died after working with yarn imported from Pakistan. A case of cutaneous anthrax was reported during the summer of 2001 in Texas, and a second case was suspected (Federation of American Scientists, 2001).

According to the Montana State Veterinarian, in 2003 anthrax caused the death of 37 cows from a single herd on tribal land northwest of Culbertson in Roosevelt County. All the remaining animals from the 250-cow herd were removed from the affected pasture and treated with antibiotics and vaccinated and a quarantine was placed on the affected premises for 40 days. Prior to this incident, the last confirmed cases of anthrax in Montana were diagnosed in 1999 in unrelated incidents, one in May in Yellowstone County and one in August in McCone County. Prior to 1999, the last case of naturally occurring anthrax in Montana was in 1985 (Montana News Association, 2003-2004).

The organism naturally occurs in the soil in many parts of Montana, as well as other states. North Dakota and South Dakota have had multiple cases of anthrax during the 2003 season when the last outbreak occurred in Montana cattle.

An anthrax outbreak among cattle in typically poses little threat to humans. Only individuals who came into direct contact with the carcass or bodily fluids of infected cattle need to be monitored for potential exposure to the disease.

Brucellosis

Brucellosis has caused devastating losses to farmers in the U.S. over the last century. It has cost the federal government, the states, and the livestock industry billions of dollars in direct losses and the cost of efforts to eliminate the disease.

Brucellosis was detected in Montana cattle on May 18, 2007 threatening the state's brucellosis-free status. While brucellosis poses only a minute risk to human health, the economic costs could severely curtail Montana's premiere beef cattle industry. Under federal rules, once brucellosis is detected, an exhaustive investigation that confirms no other cases of diseased livestock must be completed within 60 days for the state to retain its disease-free status (MDL, 2007a).

Montana Department of Public Health and Human Services (DPPHS) statistics indicate that between 1960 and 1985, when Montana acquired its brucellosis-free status, there were 28 cases of human undulant fever diagnosed in Montana. In the past 20 years since becoming brucellosis-free, only four Montanans have contracted the disease.

Montana must remain clean from brucellosis for two years after discovering the first positive herd for the state to retain its brucellosis-free status. If Montana were to lose its brucellosis-free status, all 18-month old and older reproductive cattle shipped out of the state would be tested for brucellosis within 30 days of transport, costing Montana producers and estimated \$5 million to \$15 million annually (MDL, 2007a).

Foot-and-Mouth Disease

The United States has been free of foot-and-mouth disease since 1929, and Montana Department of Livestock records dating back to 1907 do not show any cases of FMD (MDL, 2007c).

In August, 2005, a highly contagious disease similar to foot-and-mouth disease was found in both Montana and Wyoming. The first Montana cases of vesicular stomatitis, or VS, were confirmed in a horse in the Laurel area and in a cow in southwestern Wyoming. Texas reported the first case of VS in the U.S. in May, 2005. Other affected states were Arizona, Colorado, New Mexico and Colorado (Billings Gazette, 2005).

Mad Cow (BSE) Disease

The only known case of BSE disease in the United States was identified in December 2003 when the USDA announced a presumptive diagnosis in an adult Holstein cow from Washington State. Preliminary trace-back based on an ear-tag identification number suggested that the BSE-infected cow was imported into the U.S. from Canada in August 2001. This information was later confirmed by genetic testing.

On January 2 and 11, 2005, the Canadian Food Inspection Agency announced the confirmation of BSE in two cows from the province of Alberta. One of the cows was born in October 1996 and the other was born in March 1998, after the Canadian government instituted a ruminant feed ban in 1997. According to the Canadian Food Inspection Agency, no part of these animals has entered the human food supply.

To date, there have been 155 confirmed and probable cases of variant-Creutzfeldt-Jacob Disease (vCJD) worldwide among the hundreds of thousands of people that may have consumed BSE-contaminated beef products. The one reported case of vCJD in the United States was in a young woman who contracted the disease while residing in the UK and developed symptoms after moving to the U.S. (FDA, 2007a).

Plant Diseases

The most dramatic and economically serious recent example of an invasive species affecting a U.S. crop is Karnal bunt of wheat which was detected for the first time in the U.S. in March 1996. Detection of Karnal bunt caused major disruptions in U.S. grain trade with 21 countries and had economic ramifications. Detection of Karnal bunt in a Montana seed facility occurred before the seed had been distributed and thus prevented the introduction of this pathogen into Montana production fields (Western Coordinating Committee, 2000). This entailed wrapping a Montana grain elevator in plastic and fumigation.

3.3.1.3 Declared Disasters from Communicable Disease

No state or federal disaster declarations have been made as the result of a communicable disease outbreak.

3.3.1.4 Vulnerability to Communicable Disease

3.3.1.4.1 Statewide Vulnerability to Communicable Disease

The entire population of the State of Montana is at risk for contracting disease. The urban population centers are more vulnerable to rapidly spreading and highly contagious diseases than more rural parts of the state. The number of fatalities would depend on the mortality rate and the percentage of the population affected. The ability to control the spread of disease would be dependent on the contagiousness of the disease, movement of the population, and the warning time involved (Gallatin County Hazard Mitigation Plan, 2006).

Experts are not able to predict when the next influenza pandemic will occur, or which influenza virus subtype will cause it. Modeling based on the 1968 pandemic estimates 2 million to 7.4 million deaths worldwide. In the United States alone, the next influenza pandemic could cause 89,000 to 207,000 deaths and 314,000 to 734,000 hospitalizations, as well as tens of millions of outpatient visits and additional illnesses, in the absence of effective interventions. The economic costs due to deaths, illness, and hospitalizations in the United States, excluding disruptions to commerce and society, would be \$71.3 to \$166.5 billion (Meltzer and others, 1999 in CDC, 2007). The potential impact on the Montana economy has not been quantified.

Foreign plant and animal pests and diseases may be introduced into the United States through banned agricultural products and unchecked foreign goods. These pests and diseases could devastate America's crops, livestock and environment. The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) estimates that introduced plant pests result in an annual \$41 billion loss to American agriculture and cost taxpayers millions more dollars in control expenditures (USDA APHIS, 2005b). Montana's agricultural industry is also vulnerable to economic loss due to plant and animal disease.

3.3.1.4.2 Review of Potential Losses in Local PDM Plans

Figure 3.3.1-2 presents the Communicable Disease Hazard Risk Map. The colors represent a high-medium-low risk rating based on information in the Local PDM Plans. The gray color indicates this hazard was not assessed in the Local Plan. The hatch pattern indicates the Local Plans were not available for review. For electronic users of the State Plan, clicking on a county or tribal reservation will take you to the Local Plan where further information is available.

Figure 3.3.1-2 Hazard Risk Map: Communicable Disease

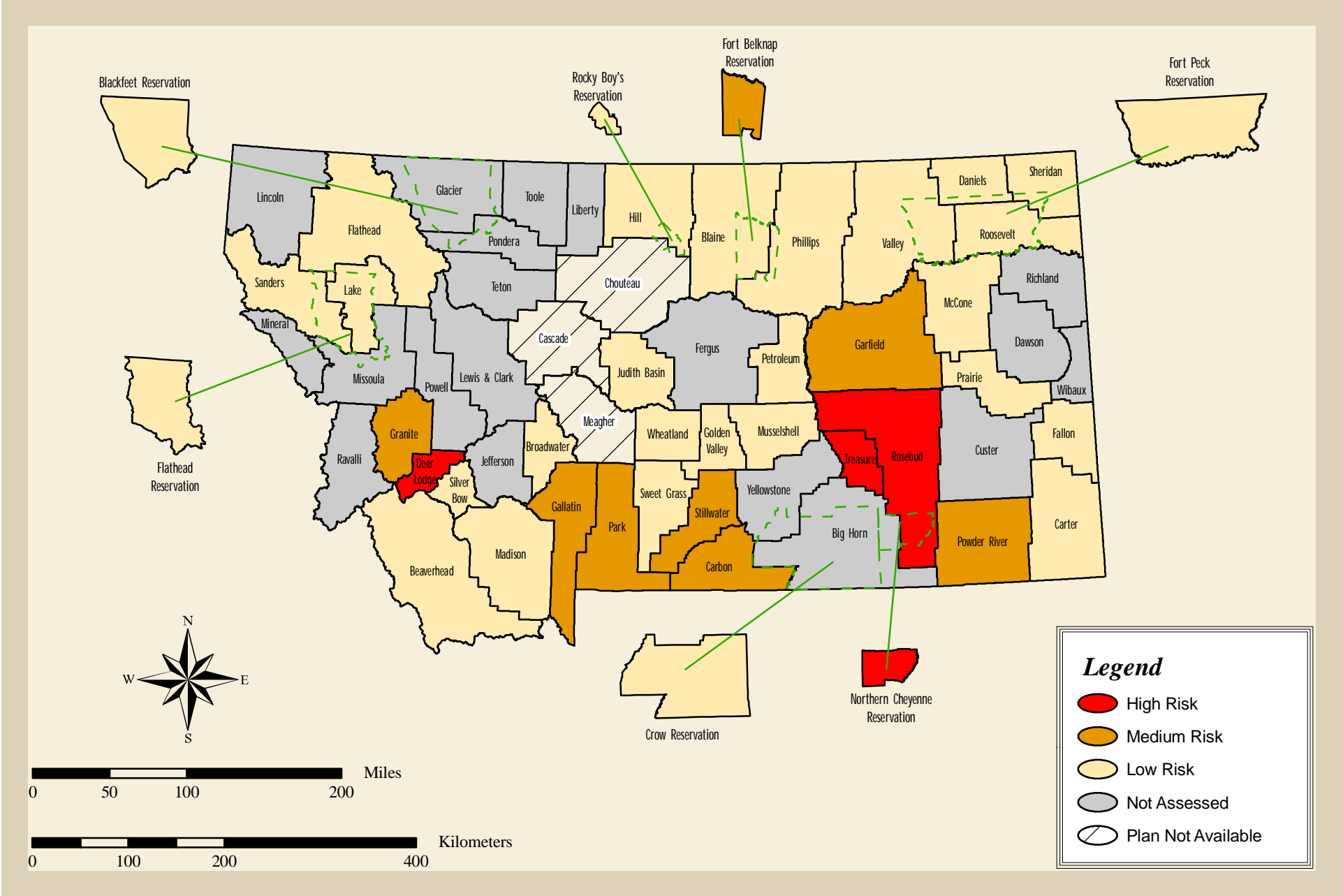


Table 3.3.1-3 presents a summary of potential loss estimates from communicable disease as calculated in the Local PDM Plans. Loss from communicable disease is described in terms of its effect on buildings, society and the economy, where generally:

- Building loss is presented either as a dollar figure or a high-moderate-low rating and typically refers to the potential loss to critical facilities in the jurisdiction.
- Societal loss is presented either as the number of lives at risk or as a high-moderate-low rating representing the potential for loss of human life.
- Economic risk is presented as high-moderate-low rating referring to the potential impact to the economy of the local jurisdiction.

References cited in **Table 3.3.1-3** correspond to a description of the method used to calculate potential loss that can be found in *Section 7.14*.

Table 3.3.1-3 Potential Losses from Local Plans: Communicable Disease

DES District	Jurisdiction	Building Loss	Societal Loss	Economic Loss	Reference
1	Deer Lodge County	Low	High	High	1
1	Flathead County	Low	Moderate	Moderate	8
1	Flathead Reservation	NA	NA	NA	
1	Granite County	Low	High	High	1
1	Lake County	NA	NA	NA	
1	Lincoln County	NA	NA	NA	
1	Mineral County	NA	NA	NA	
1	Missoula County	NA	NA	NA	
1	Powell County	NA	NA	NA	
1	Ravalli County	NA	NA	NA	
1	Sanders County	NA	NA	NA	
1	Silver Bow County	Low	Moderate	Moderate	1
2	Blackfeet Reservation	NA	NA	NA	
2	Blaine County	NA	NA	NA	
2	Cascade County	U	U	U	
2	Chouteau County	U	U	U	
2	Fort Belknap Reservation	NA	NA	NA	
2	Glacier County	NA	NA	NA	
2	Hill County	NA	NA	NA	
2	Liberty County	NA	NA	NA	
2	Pondera County	NA	NA	NA	
2	Rocky Boy's Reservation	NA	NA	NA	
2	Teton County	NA	NA	NA	
2	Toole County	NA	NA	NA	
3	Beaverhead County	\$0	2,779	NA	5
3	Broadwater County	Low	Moderate	High	1
3	Gallatin County	Low	High	High	12
3	Jefferson County	NA	NA	NA	
3	Lewis & Clark County	NA	NA	NA	
3	Madison County	NA	NA	NA	
3	Meagher County	U	U	U	
3	Park County	Low	High	High	1

Table 3.3.1-3 Potential Losses from Local Plans: Communicable Disease

DES District	Jurisdiction	Building Loss	Societal Loss	Economic Loss	Reference
3	Sweet Grass County	NA	NA	NA	
4	Carter County	Low	Low	Low	12
4	Custer County	NA	NA	NA	
4	Dawson County	NA	NA	NA	
4	Fallon County	NA	Low	Low	8
4	Garfield County	NA	448	\$25 million	1
4	McCone County	NA	Moderate	Moderate	3
4	Powder River County	Low-Moderate	650	Millions	1
4	Prairie County	NA	NA	NA	
4	Richland County	NA	NA	NA	
4	Wibaux County	NA	NA	NA	
5	Big Horn County	NA	NA	NA	
5	Carbon County	NA	NA	\$111,000	8
5	Crow Reservation	NA	High	NA	3
5	Golden Valley County	NA	NA	NA	
5	Musselshell County	NA	NA	NA	
5	Northern Cheyenne Reservation	NA	Moderate	NA	3
5	Rosebud County	Moderate	High	High	1
5	Stillwater County	NA	NA	\$83,100	8
5	Treasure County	Low	High	High	1
5	Wheatland County	NA	NA	NA	
5	Yellowstone County	NA	NA	NA	
6	Daniels County	NA	NA	NA	
6	Fergus County	NA	NA	NA	
6	Fort Peck Reservation	NA	NA	NA	
6	Judith Basin County	NA	NA	NA	
6	Petroleum County	NA	NA	NA	
6	Phillips County	NA	NA	NA	
6	Roosevelt County	NA	NA	NA	
6	Sheridan County	NA	NA	NA	
6	Valley County	NA	NA	NA	

Notes: U = Local PDM Plan not available for review; NA = not assessed in Local PDM Plan.

Potential loss was computed was not computed in a uniform manner in Local PDM Plans. See number reference in *Section 7.14* for a description of the methods used to calculate potential building, societal and economic loss.

3.3.1.4.3 Vulnerability of State Property

In general, critical facilities are not structurally threatened by communicable disease; however, their accessibility and function can be lost. Contamination of a critical facility could render the facility non-functional until decontamination or the threat has passed. For this reason, all critical facilities are assumed to be at risk from communicable disease. As with any human biological event, the hospitals and health service providers would most likely discover a threat and possibly become the first contaminated (Gallatin County Hazard Mitigation Plan, 2006). Public water systems are also potentially at risk to communicable diseases.

3.3.1.5 Impact of Future Development

Future development would not be directly impacted by communicable disease, but any additional residents would be at risk for disease. Future development would not impact the communicable disease hazard within the agricultural community.

3.3.1.6 Communicable Disease Data Limitations

Disease is a difficult hazard for which to provide specific vulnerabilities. For a disease to have a major impact, it first has to enter the community and then spread. That starting point, how the disease progresses, and preventive actions taken will determine the eventual outcome (Gallatin County Hazard Mitigation Plan, 2006). The data and analysis are limited by these outside factors.

3.3.1.7 Communicable Disease References

AIDS Action, 2007. State Facts: HIV/AIDS in Montana.

http://www.aidsaction.org/communications/publications/statefactsheets/pdfs/2005/montana_2005L.pdf

Billings Gazette, 2005. Horse, Cow Disease hits Montana. August 11, 2005.

<http://www.billingsgazette.com/newdex.php?display=rednews/2005/08/11/build/state/25-animal-disease.inc>

Cattle Today, 2007. <http://cattletoday.info/anthrax.htm>

Center for Disease Control (CDC), 2007. National Center for Infectious Diseases.

CWD: <http://www.cdc.gov/ncidod/dvrd/cwd/>

E. coli: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/escherichiacoli_g.htm

Hantavirus: <http://www.cdc.gov/ncidod/diseases/hanta/hps/index.htm>

HIV/AIDS: <http://www.cdc.gov/hiv/topics/basic/index.htm>

Mad Cow Disease: <http://www.cdc.gov/ncidod/dvrd/bse/>

Norovirus: <http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm>

Pandemic Influenza: Vaccines for Pandemic Influenza. Catherine J. Luke and Kanta

Subbarao. <http://www.cdc.gov/ncidod/eid/vol12no01/05-1147.htm>

Salmonella: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm

Shigella: <http://www.cdc.gov/ncidod/dpd/healthywater/factsheets/shigella.htm>

West Nile Virus: http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm;

<http://www.cdc.gov/ncidod/dvbid/westnile/background.htm>

Federation of American Scientists, 2001. Anthrax in the United States: 1997 to 2001.

<http://www.fas.org/ahead/disease/anx/outbreak/2001usa-ss0.htm>

Gallatin County Hazard Mitigation Plan. 2006.

Mad Cow Facts, 2007. <http://www.mad-cow-facts.com/about.htm>

Meltzer, M.T., N.J. Cox, and K. Fukuda. 1999. The Economic Impact of Pandemic Influenza in the United States: Priorities for Interventions. *Emerging Infectious Disease*. 1999;5:659-71.

Montana Department of Livestock (MDL), 2007a. Montana's Ongoing Brucellosis Investigation. By Dr. Jeanne Rankin, Acting State Veterinarian.

Montana Department of Livestock (MDL), 2007b. PowerPoint Presentation on CAPS – Cooperative Agricultural Pest Survey.

Montana Department of Livestock (MDL), 2007c. Foot and Mouth Disease.
<http://mt.gov/liv/animalhealth/diseases/fmd/general.asp>

Montana Department of Livestock. 2004. Foot-and-Mouth. Animal Health Division.

Montana Department of Livestock, no date (n.d.). "Oh, Give Me a Home, Where Disease-Free Buffalo Roam...".

Montana Department of Public Health and Human Services (MDPHHS), 2006a. State of Montana. E.P.I Program. <http://www.dphhs.mt.gov/westnile/>
http://www.dphhs.mt.gov/PHSD/ph-informatics/pdf/HAN_Archives/Norovirus.pdf

Montana Department of Public Health and Human Services (MDPHHS), 2006b. 2005 Communicable Disease Summary.

Montana News Association, 2003-2004. Anthrax in Montana: Confirmed in Northeastern Montana. <http://www.montanasnews.com/articles.php?mode=view&id=2509>

Montana State University (MSU) Ag-Extension, 2004. MontGuide Fact Sheet 9404. Hantavirus: What is it and what can be done about it?
<http://www.montana.edu/wwwpb/pubs/mt9404.html>

Montana State University (MSU) Extension Service, 2004. Integrated Pest Management Report. <http://ipm.montana.edu/Report2004.htm>

Moritsugu, Dr. Ken, 2006. Opening Remarks at the Montana State Summit. Deputy U.S. Surgeon General. May 22, 2006.
<http://pandemicflu.gov/general/greatpandemic2.html#montana>

National Archives, 2007. The Deadly Virus: The Influenza Epidemic of 1918.
<http://www.archives.gov/exhibits/influenza-epidemic/>

National Law Journal, 1997. Jack in the Box Ends E. Coli Suits. The National Law Journal, November 17, 1997. <http://www.about-ecoli.com/news/jack-in-the-box6.htm>

U.S. Department of Agriculture (USDA), National Agricultural Statistics Service, 2006.
http://www.nass.usda.gov/Statistics_by_State/Montana/Publications/economic/mtrank.htm

U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), 2005a. High-Pathogenicity Avian Influenza: A Threat to U.S. Poultry. Program Aid No. 1836.

U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), 2005b. The Cooperative Agricultural Pest Survey. U.S. Department of Agriculture, Animal and Plant Health Inspection Service. Program Aid No. 1830.

U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), 2007. Brucellosis and Yellowstone Bison.

<http://www.aphis.usda.gov/vs/nahps/brucellosis/cattle.htm>

U.S. Food and Drug Administration (FDA), 2007a. Commonly Asked Questions About BSE in Products Regulated by FDA's Center for Food Safety and Applied Nutrition.

<http://www.cfsan.fda.gov/~comm/bsefaq.html>.

U.S. Food and Drug Administration (FDA), 2007b. FDA Finalizes Report on 2006 Spinach Outbreak. March 23, 2007. <http://www.fda.gov/bbs/topics/NEWS/2007/NEW01593.html>

Western Coordinating Committee, 2000. *Research on Diseases of Cereals*. A Petition to the Western Regional Experiment Station Directors for Continuation of a Western Coordinating Committee.

World Health Organization (WHO), 2007. Avian influenza: assessing the pandemic threat.

http://www.who.int/csr/disease/influenza/WHO_CDS_2005_29/en/